

Measure: Community Climate Challenge (E14 and E23-Energy Efficiency Education Program)

Design and implement a community-wide climate challenge. Primarily, implementation of this measure consists of a website where households can pledge a reduction, estimate their impact, and learn ways to promote energy efficiency and conserve energy. The costs involved are a result of the website, personnel to run the campaign, and advertising.

COT ARRA RFP Summary:

Emission reduction potential by 2020:	7,884 tCO ₂ e over 10-years
Percentage of goal (2012):	0.41%
Percentage of goal (2020):	0.35%
Total annual average implementation costs:	\$33,311
Entity that bears the costs of implementation:	Government
Cost/Savings per tCO ₂ e:	\$4.23 / tCO ₂ e
Net annual savings:	\$16.35 / home / year
Entity that realizes the financial return:	House
Equitability (progressive/regressive, income/revenue neutral, etc):	Progressive; low income neighborhoods could be targeted
Potential unintended consequences:	See below

Background information:

A Community Climate Challenge (“Challenge” hereafter) is a program primarily aimed at community-wide educational outreach campaign and strategic community partnerships that encourage participants to voluntarily reduce their greenhouse gas (GHG) emissions. According to Denver’s Mayor, John Hickenlooper: ¹

“We’ve had a lot of success with our Residential Climate Challenge program, ... Because energy conservation is best met by a change in individuals’ behavior, helping people learn how to make change in their home is proving critical to our carbon reduction goals.”

Challenge programs are believed to be an important part of larger, community-wide sustainability frameworks, while being synergistic with other short- to medium-term climate strategies (eg, recycling, home/business energy audits, smart meter implementation, energy efficiency programs). However, these synergies result in difficulties relative to GHG saving and economic cost disaggregation (discussed below).

In some programs, residential and corporate community-members are engaged to contribute to overall reductions of community GHG emissions by pledging to reduce their emissions. Challenges in many communities are supported by a website wherein pledges can be made, links are provided for resources and information, and individual/household emissions can be calculated via a ‘carbon calculator’. ²

Participating members usually bear the cost of any energy efficiency upgrades (that may be offset partially or wholly) by local incentives. Costs to the implementing body are usually minimal including staff time and a website.

A Challenge has the ability to enhance other mitigation initiatives included in this report. Programs in cities like Denver and Ft. Collins, Colorado and Burlington, Vermont have implemented a variety of Challenges with different expectations and varying levels of confidence in participation. Applicable GHG abatement and economic assumptions will be used in this analysis.

Business as Usual:

Absent a community climate challenge, households will miss out on some energy reduction measures and behavior changes that result in energy conservation and energy efficiency.

Description of Measure and Implementation Scenario:

Incorporation of a residential Challenge into a broader climate change framework could help support other related initiatives while providing some level of behavioral change.³

This measure consists of a residential educational campaign to engage community members to reduce their household emissions and water consumption. Incorporation of water in the challenge will not result in material GHG emission reductions from decreased energy usage by Tucson Water although such an addition is consistent with regional adaptation strategies.

The carbon analysis assumes that a Tucson Residential Climate Challenge would be partially modeled after the Fort Collins projections. Current total emissions in Ft. Collins are 2.1 MtCO₂e (2009), with residential comprising 22% of the total (ie, 497,640 tCO₂e- assumed to be residential electricity only).

Has the Measure been implemented elsewhere and with what results?:

Many US cities have incorporated some form of Challenge into their larger climate planning frameworks. However, the programs are not necessarily comparable. Some programs simply ask for a pledge and provide some resources and links to information. Other programs include a variety of other community-relevant climate change measures. Below, the Challenges for Burlington, Vermont, Ft. Collins, Colorado and Denver, Colorado are described below:

Ft. Collins Community Climate Challenge:⁴

The program is “for the residential sector, focusing on an educational campaign to promote actions with a goal of reducing 1% of per capita GHG emissions. A key component would be youth- focused programs (in-school programs, scouts, youth groups, church groups, services groups, etc.” They estimate a 25,000 ton reduction of CO₂e in 2012, but the program is considered to have a 90% overlap with other short-term climate strategies. The projected costs to Ft. Collins are \$30,000/yr plus administrative personnel. The project is currently postponed “until a broad interdepartmental environmental communication plan was developed.”

Denver’s Residential Climate Challenge:⁵

Denver’s program is more a suite of community energy efficiency and energy conservation programs aimed at household emission reductions. Their measures include a compact fluorescent lamps (CFL) program, smart meters, free energy audits, a low-income neighborhood energy conservation program, and transit marketing. Taken in concert, the projected GHG savings from these measures are close to 160,000 tCO₂e annually.

Burlington’s 10% Challenge:⁶

“The 10% Challenge is a voluntary program developed to raise public awareness about global warming and to encourage households and businesses to reduce their global warming-causing greenhouse gas (GHG) emissions by at least ten percent.” The associated website offers a carbon calculator, links to resources for

individuals and businesses, and a place for participants to make their pledge to reduce their GHG emissions. Given the program's structure, the initial capital costs of the program were reported to be a \$12,000 capital investment in a website and \$500 - \$1,000 for website maintenance.

Understanding that the UA Student report for this measure concentrated on extrapolations of Burlington's pledge data, the analysis herein will focus on the Ft. Collins model for projected emission reductions. It is worthwhile to note that a recent consulting report to Burlington listed such action *"will have no or little impact on the City's GHG emissions inventory, [is] not easily assessable, may be cost-prohibitive and/or impractical, and/or are not suited to near- or mid-term implementation. Though not immediately useful, [it] may provide fodder for future GHG reduction ideas and general City sustainability strategy development."*⁷

Energy/Emission analysis:

Description	Input	Notes
<i>Ft. Collins Inputs</i>		
2009 GHG	2,604,559	tCO ₂ e
Residential %	22%	
Total Residential GHG emissions	573,003	Assumed only electricity
Housing Units (2009)	59229	http://www.fcgov.com/advanceplanning/trends.php
Population (2009)	137,200	http://www.fcgov.com/advanceplanning/trends.php
Per Capita Emissions	19.0	
Residential GHG Total per household	9.7	
Assume campaign reaches 60% of homes	35,537	
Assume 20% of 60% implement	7,107	Houses that implement
Total assumed annual reduction (excluding double counting)	2,500	tCO ₂ e
% reduction from Challenge	0.44%	
Reduction per house implementing	0.4	tCO ₂ e
% reduction per household	3.6%	
Capital costs per home that campaign reached	\$1.41	
Capital costs per tCO ₂ e abated	\$20.00	

<i>Tucson Analysis</i>		
2008 GHG	7,227,674	tCO ₂ e
Residential Energy Use	25%	
Total Residential GHG emissions (electricity only)	1,806,919	tCO ₂ e
Housing Units (2008)	394,600	
Population (2006)	555,975	Derived from 2010 Inventory
Per Capita	13	Per 2010 Inventory
Residential GHG TOT per household	4.6	
Assume campaign reaches 60% of homes	236,760	
Assume 20% of 60% implement	47,352	
Assume similar home reduction to FC	7,884	tCO ₂ e
Reduction per house implementing	0.2	tCO ₂ e
% reduction per household	3.6%	
Capital costs	\$333,113	Extrapolated from Ft. Collins per home cost, assumed to be over 10-years
Capital costs per tCO ₂ e abated in first year	\$4.23	Difference is due to home efficiency in TUC v. Ft. Collins
Additional savings from incorporating water	384	tCO ₂ e

Contribution analysis:		
COT 1990 Citywide GHG emissions (baseline) ⁸ :	5,461,020	tCO ₂ e
MCPA 7% reduction target for COT:	5,078,749	
2012 BAU GHG emissions projection:	7,000,000	
2020 BAU GHG emissions projection:	7,343,141	
GHG emissions reduction to meet 7% goal (2012):	1,921,251	
GHG emissions reduction to meet 7% goal (2020):	2,264,392	
<i>Community Climate Challenge</i>		
Contribution of E14 Community Climate Challenge:	7,884	tCO ₂ e
2020 Contribution of E14 Community Climate Challenge:	0.35	%

Regarding water: given an average of 110 GPCD (residential gallons per capita per day) and an average of 1.41 people per household (derived from above), each home uses approximately 56,570 gallons per year.⁹ The embedded energy in delivering a gallon of water for Tucson is 0.002475 kWh of electricity and 0.000295 gas therms.¹⁰ 1kWh of electricity in Tucson is equal to 856g CO₂e (derived from PAG's GHG Inventory) 1 therm of gas is equal to 5470g CO₂e.¹¹ Therefore, one gallon has 2.35g CO₂e (elec) plus 1.61 CO₂e (therm), or a total of 3.96 gCO₂e/gal. If the Challenge produces the same 3.6% reduction in water as calculated for GHGs above, 2,037 gals/yr would be saved. Over the 47,352 homes assumed to participate, that would total 96.4M gallons and, therefore, 382 tCO₂e. Although adding the water might be advisable from an adaptation vantage, it doesn't produce substantive GHG reductions and is, therefore, left out of the final numbers.

Economic analysis:

Gains achieved from educational campaigns are hard to quantify, especially in light of no representative data. The economic analysis is based on extrapolated data from Ft. Collins' projected costs and energy savings as indicated above.

The costs are assumed to be directly proportional to the quantity of homes targeted by the educational campaign. The analysis that the campaign reaches nearly 240K homes and that 20% of those homes implement some GHG emission reductions resulting in a reduction of 7,884 tCO₂e/yr. The capital cost of the campaign is approximately \$333K resulting in a cost per metric ton of CO₂e reduced of \$4.23 over a 10-year life of the program.

Savings to each home is calculated to be:

$$0.2 \text{ tCO}_2\text{e/home} \times 1,000,000 \text{ g/t} \times (1 \text{ kWh}/856 \text{ gCO}_2\text{e}) \times \$0.07/\text{kWh} = \$16.35/\text{home/yr}$$

Co-benefits:

Although the above GHG savings and economic analysis don't have a large impact on the City's overall goals, there are other benefits from incorporating such a Challenge into a large framework of mitigation and adaptation measures. If the measure is carried out in a similar fashion to Denver's Residential Climate Challenge, the collective net energy savings could be closer to something that they are projecting (8% towards their emission reduction target).

Furthermore, a successful educational campaign could make future initiatives more politically feasible, the implementation of such a program is equitable to all socioeconomic levels of Tucson's constituents, and integration of a water reduction challenge lends itself to regionally applicable adaptation strategies.

Equitability:

The measure is income neutral and the marketing can be directed to the neighborhoods of the COT choosing.

Potential unintended consequences:

Given public polling, some skeptical/denialist households/constituents could be vocal about their dismay over the use of public funds for such endeavors. However, such educational campaigns are crucial to turn the tide of public opinion and understanding.

NOTE on E23 Energy Efficiency Education Program:

This measure's implementation is the same as that of E14 (Community Climate Challenge) and E7 (Climate Wise). It is important during our analyses we don't allow for double counting of emission reductions. Therefore, any reductions from an energy efficiency program are accounted for under the above mention measures.

General Note: All references retrieved October through December of 2010 unless otherwise noted.

Endnotes:

¹ <http://www.usmayors.org/climateprotection/reports/power-of-86-million-1000thMayor.pdf>.

² A carbon calculator helps an individual/household understand their GHG emissions.

³ A corporate outreach campaign is under a different designation in this report- *Climate Wise*. Different municipalities either call this measure a Corporate Climate Challenge (Denver, CO), Climate Wise (Ft. Collins, CO), or Climate Partnership (Seattle, WA)

⁴ Ft. Collins Climate Action Plan 2007

⁵ Denver's Climate Action Plan

⁶ http://www.cleanair-coolplanet.org/for_communities/PDFs/10PercentChallenge.pdf

⁷ City of Burlington Climate Action Plan, 2010

⁸ PAG Regional Greenhouse Gas Inventory- 2010

⁹ Tucson Water- Water Plan: 2000-2050, Chapter 3

¹⁰ <ftp://www.pima.gov/wwwroot/CEDnew/includes/%255C/wwwroot/Administration/Sustainability/GHC%2520Emissions%2520Target%2520and%2520Forecast.pdf>

¹¹ http://carbon-calc.erg.berkeley.edu/documentation/CoolClimate_TA_methods_121709.pdf